UNITED STATES PATENT OFFICE.

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ALTERNATING-ELECTRIC-CURRENT GENERATOR.

SPECIFICATION forming part of Letters Patent No. 447,921, dated March 10, 1891.

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To all whom it may concern:

Be it known that I, NIKOLA TESLA, a subject of the Emperor of Austria, from Smiljan, Lika, border country of Austria-Hungary, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Alternating-Current Machines, of which the following is a specification, reference being had to the accompanying drawings.

In the systems of distribution of electrical energy from alternating-current generators in present use the generators give ordinarily from one to three hundred alternations of current per second. I have recognized and demonstrated in practice that it is of great advantage, on many accounts, to employ in such systems generators capable of producing a very much greater number of alternations per second—say fifteen thousand per second or many more. To produce such a high rate of alternation, it is necessary to construct a machine with a great number of poles or polar projections; but such construction, on this account, in order to be efficient, is rendered difficult. If an armature without polar projections be used, it is not easy to obtain the necessary strength of field, mainly in consequence of the comparatively great leakage of the lines of force from pole to pole. If, on the contrary, an armature-core formed or provided with polar projections be employed, it is evident that a limit is soon reached at which the iron is not economically utilized, being incapable of following without considerable loss the rapid reversals of polarity. To obviate these and other difficulties, I have devised a form of machine embodying the following general features of construction.

I provide a field-magnet core made up of two independent parts formed with grooves for the reception of one or more energizing-coils. The energizing coil, or coils, is completely surrounded by the iron core, except on one side, where occurs the opening between the polar faces of the core, which opening is made as narrow as the conditions of the machine will permit. The polar faces of the core of the field are not smooth, but formed with a great many projections or serrations, the points of which in one side or polar face are preferably exactly opposite those in the other. Between the faces so formed I mount or support the armature coil or coils and provide either for rotating the field-magnet or the armature, or both, and I arrange the said armature-coil or conductor so that it will be symmetrically disposed with respect to the field—that is to say, so that when one portion of the conductor is passing through the strongest portion of the field the other portion, which forms the return for the former, is passing through the weakest points or parts of the field. The strongest points of the field, it will be understood, are those between the projections or points on the polar faces, while the weakest points lie midway between them.

A field-magnet, when constructed as above described, produces, when the energizing-coil is traversed by a continuous current, a field of great strength, and one which may be made to vary greatly in intensity at points not farther distant from one another than the eighth of an inch. In a machine thus constructed there is comparatively little of that effect which is known as "magnetic leakage," and there is also but a slight armature reaction. Either the armature-conductor or the field-magnet may be stationary while the other rotates, and as it is often desirable to maintain the conductors stationary and to rotate the field-magnet I have made a special modification of the construction of the machine for this purpose, and with a view in such case of still further simplifying the machine and rendering it more easy to maintain in operation I arrange the armature-conductors and the frame or supports therefor so as to support also a fixed coil or coils for energizing the rotating field-magnet, thus obviating the employment of all sliding contacts.

In the accompanying drawings I have illustrated the two typical forms of my machine above referred to.

Figure 1 is a vertical central section of the machine, taken on lines $x\ x$ of Fig. 2; and Fig. 2 is a horizontal section on line $y\ y$ of Fig. 1. The machine in these two figures is one in which the armature-conductor and the field-coil are stationary while the field-magnet core revolves. Fig. 3 is a vertical central section of a machine embodying the same plan of construction, but having a stationary field-